

## H ELECTRICITY

### Note(s)

- These Notes cover the basic principles and general instructions for use of section H.

#### I. Section H covers:

- basic electric elements, which cover all electric units and the general mechanical structure of apparatus and circuits, including the assembly of various basic elements into what are called printed circuits and also cover to a certain extent the manufacture of these elements (when not covered elsewhere);
- generation of electricity, which covers the generation, conversion and distribution of electricity together with the controlling of the corresponding gear;
- applied electricity, which covers:
  - general utilisation techniques, viz. those of electric heating and electric lighting circuits;
  - some special utilisation techniques, either electric or electronic in the strict sense, which are not covered by other sections of the Classification, including:
    - electric light sources, including lasers;
    - electric X-ray technique;
    - electric plasma technique and the generation and acceleration of electrically charged particles or neutrons;
- basic electronic circuits and their control;
- radio or electric communication technique;
- the use of a specified material for the manufacture of the article or element described. In this connection, paragraphs 88 to 90 of the Guide should be referred to.

#### II. In this section, the following general rules apply:

- Subject to the exceptions stated in I(c), above, any electric aspect or part peculiar to a particular operation, process, apparatus, object or article, classified in one of the sections of the Classification other than section H, is always classified in the subclass for that operation, process, apparatus, object or article. Where common characteristics concerning technical subjects of similar nature have been brought out at class level, the electric aspect or part is classified, in conjunction with the operation, process, apparatus, object or article, in a subclass which covers entirely the general electrical applications for the technical subject in question;
- The electrical applications referred to under (a), above, either general or particular, include:
  - the therapeutic processes and apparatus, in class A61;
  - the electric processes and apparatus used in various laboratory or industrial operations, in classes B01 and B03 and in subclass B23K;
  - the electricity supply, electric propulsion and electric lighting of vehicles in general and of particular vehicles, in the subsection "Transporting" of section B;
  - the electric ignition systems of internal-combustion engines, in subclass F02P, and of combustion apparatus in general, in subclass F23Q;
  - the whole electrical part of section G, i.e. measuring devices including apparatus for measuring electric variables, checking, signalling and calculating. Electricity in that section is generally dealt with as a means and not as an end in itself;
- All electrical applications, both general and particular, presuppose that the "basic electricity" aspect appears in section H (see I(a) above) as regards the electric "basic elements" which they comprise. This rule is also valid for applied electricity, referred to in I(c), above, which appears in section H itself.

#### III. In this section, the following special cases occur:

- Among the general applications covered by sections other than section H, it is worth noting that electric heating in general is covered by subclasses F24D or F24H or class F27, and that electric lighting in general is partly covered by class F21, since in section H (see I(c), above) there are places in H05B which cover the same technical subjects;
- In the two cases referred to under (a), above, the subclasses of section F, which deal with the respective subjects, essentially cover in the first place the whole mechanical aspect of the apparatus or devices, whereas the electrical aspect, as such, is covered by subclass H05B;
- In the case of lighting, this mechanical aspect should be taken to cover the material arrangement of the various electric elements, i.e., their geometrical or physical position in relation to one another; this aspect is covered by subclasses of class F21, the elements themselves and the primary circuits remaining in section H. The same applies to electric light sources, when combined with light sources of a different kind. These are covered by subclass H05B, whereas the physical arrangement which their combination constitutes is covered by subclasses of class F21;
- As regards heating, not only the electric elements and circuitry designs, as such, are covered by subclass H05B, but also the electric aspects of their arrangement, where these concern cases of general application; electric furnaces being considered as such. The physical disposition of the electric elements in furnaces is covered by section F. If a comparison is made with electric welding circuits, which are covered by subclass B23K in connection with welding, it can be seen that electric heating is not covered by the general rule stated in II, above.

## H01 BASIC ELECTRIC ELEMENTS

### Note(s) [7]

- Processes involving only a single technical art, e.g. drying, coating, for which provision exists elsewhere are classified in the relevant class for that art.
- Attention is drawn to the Notes following the titles of class B81 and subclass B81B relating to "microstructural devices" and "microstructural systems".

**H01L SEMICONDUCTOR DEVICES; ELECTRIC SOLID STATE DEVICES NOT OTHERWISE PROVIDED FOR** (use of semiconductor devices for measuring G01; resistors in general H01C; magnets, inductors, transformers H01F; capacitors in general H01G; electrolytic devices H01G 9/00; batteries, accumulators H01M; waveguides, resonators, or lines of the waveguide type H01P; line connectors, current collectors H01R; stimulated-emission devices H01S; electromechanical resonators H03H; loudspeakers, microphones, gramophone pick-ups or like acoustic electromechanical transducers H04R; electric light sources in general H05B; printed circuits, hybrid circuits, casings or constructional details of electrical apparatus, manufacture of assemblages of electrical components H05K; use of semiconductor devices in circuits having a particular application, see the subclass for the application) [2]

### Note(s) [2010.01]

#### 1. This subclass covers:

- electric solid state devices which are not covered by any other subclass and details thereof, and includes: semiconductor devices adapted for rectifying, amplifying, oscillating or switching; semiconductor devices sensitive to radiation; electric solid state devices using thermoelectric, superconductive, piezo-electric, electrostrictive, magnetostrictive, galvano-magnetic or bulk negative resistance effects and integrated circuit devices;
- photoresistors, magnetic field dependent resistors, field effect resistors, capacitors with potential-jump barrier, resistors with potential-jump barrier or surface barrier, incoherent light emitting diodes and thin-film or thick-film circuits;
- processes and apparatus adapted for the manufacture or treatment of such devices, except where such processes relate to single-step processes for which provision exists elsewhere.

#### 2. In this subclass, the following terms or expressions are used with the meaning indicated:

- "wafer" means a slice of semiconductor or crystalline substrate material, which can be modified by impurity diffusion (doping), ion implantation or epitaxy, and whose active surface can be processed into arrays of discrete components or integrated circuits;
- "solid state body" means the body of material within which, or at the surface of which, the physical effects characteristic of the device occur. In thermoelectric devices, it includes all materials in the current path.

Regions in or on the body of the device (other than the solid state body itself), which exert an influence on the solid state body electrically, are considered to be "electrodes" whether or not an external electrical connection is made thereto. An electrode may include several portions and the term includes metallic regions which exert influence on the solid state body through an insulating region (e.g. capacitive coupling) and inductive coupling arrangements to the body. The dielectric region in a capacitive arrangement is regarded as part of the electrode. In arrangements including several portions, only those portions which exert an influence on the solid state body by virtue of their shape, size, or disposition or the material of which they are formed are considered to be part of the electrode. The other portions are considered to be "arrangements for conducting electric current to or from the solid state body" or "interconnections between solid state components formed in or on a common substrate", i.e. leads;

- "device" means an electric circuit element; where an electric circuit element is one of a plurality of elements formed in or on a common substrate it is referred to as a "component";
- "complete device" is a device in its fully assembled state which may or may not require further treatment, e.g. electroforming, before it is ready for use but which does not require the addition of further structural units;
- "parts" includes all structural units which are included in a complete device;
- "container" is an enclosure forming part of the complete device and is essentially a solid construction in which the body of the device is placed, or which is formed around the body without forming an intimate layer thereon. An enclosure which consists of one or more layers formed on the body and in intimate contact therewith is referred to as an "encapsulation";
- "integrated circuit" is a device where all components, e.g. diodes, resistors, are built up on a common substrate and form the device including interconnections between the components;
- "assembly" of a device is the building up of the device from its component constructional units and includes the provision of fillings in containers.

#### 3. In this subclass, both the process or apparatus for the manufacture or treatment of a device and the device itself are classified, whenever both of these are described sufficiently to be of interest.

#### 4. Attention is drawn to Note (3) after the title of section C, which Note indicates to which version of the periodic table of chemical elements the IPC refers. In this subclass, the Periodic

System used is the 8 group system indicated by Roman numerals in the Periodic Table thereunder.

#### Subclass index

#### SEMICONDUCTOR DEVICES

Devices adapted for rectifying, amplifying, oscillating, or switching

29/00

Devices sensitive to, or emitting, radiation

31/00, 33/00

#### SOLID STATE DEVICES USING ORGANIC MATERIALS

51/00

#### OTHER SOLID STATE DEVICES

Thermoelectric or thermomagnetic devices

35/00, 37/00

Superconductive or hyperconductive devices

39/00

Piezo-electric, electrostrictive or magnetostrictive elements in general

41/00

Galvano-magnetic devices

43/00

Devices without a potential-jump or a surface barrier; bulk negative resistance effect devices; devices not otherwise provided for

45/00, 47/00, 49/00

#### ASSEMBLIES OF SEMICONDUCTOR OR OTHER SOLID STATE DEVICES

Assemblies of individual devices

25/00

Integrated circuits

27/00

#### DETAILS

23/00

#### MANUFACTURE

21/00

#### H01L 21/00 Processes or apparatus specially adapted for the manufacture or treatment of semiconductor or solid state devices or of parts thereof [2006.01]

Note(s) [2]

- Group H01L 21/70 takes precedence over groups H01L 21/02-H01L 21/67.

H01L 21/02 • Manufacture or treatment of semiconductor devices or of parts thereof [2006.01]

H01L 21/027 • • Making masks on semiconductor bodies for further photolithographic processing, not provided for in group H01L 21/18 or H01L 21/34 [2006.01]

H01L 21/033 • • • comprising inorganic layers [2006.01]

H01L 21/04 • • the devices having at least one potential-jump barrier or surface barrier, e.g. PN junction, depletion layer, carrier concentration layer [2006.01]

H01L 21/06 • • the devices having semiconductor bodies comprising selenium or tellurium in uncombined form other than as impurities in semiconductor bodies of other materials [2006.01]

H01L 21/08 • • • Preparation of the foundation plate [2006.01]

H01L 21/10 • • • Preliminary treatment of the selenium or tellurium, its application to the foundation plate, or the subsequent treatment of the combination [2006.01]

H01L 21/103 • • • • Conversion of the selenium or tellurium to the conductive state [2006.01]

H01L 21/105 • • • • Treatment of the surface of the selenium or tellurium layer after having been made conductive [2006.01]

H01L 21/108 • • • • Provision of discrete insulating layers, i.e. non-genetic barrier layers [2006.01]

H01L 21/12 • • • Application of an electrode to the exposed surface of the selenium or tellurium after the selenium or tellurium has been applied to the foundation plate [2006.01]

H01L 21/14 • • • Treatment of the complete device, e.g. by electroforming to form a barrier [2006.01]

H01L 21/145 • • • • Ageing [2006.01]

H01L 21/16 • • the devices having semiconductor bodies comprising cuprous oxide or cuprous iodide [2006.01]

H01L 21/18 • • the devices having semiconductor bodies comprising elements of group IV of the Periodic System or  $A_{III}B_V$  compounds with or without impurities, e.g. doping materials [2006.01]

Note(s) [7]

- This group covers also processes and apparatus which, by using the appropriate technology, are clearly suitable for manufacture or treatment of devices whose bodies comprise elements of Group IV of the Periodic System or  $A_{III}B_V$  compounds, even if the material used is not explicitly specified.

H01L 21/20 • • • • Deposition of semiconductor materials on a substrate, e.g. epitaxial growth [2006.01]

H01L 21/203 • • • • using physical deposition, e.g. vacuum deposition, sputtering [2006.01]

H01L 21/205 • • • • using reduction or decomposition of a gaseous compound yielding a solid condensate, i.e. chemical deposition [2006.01]

H01L 21/208 • • • • using liquid deposition [2006.01]

H01L 21/22 • • • Diffusion of impurity materials, e.g. doping materials, electrode materials, into, or out of, a semiconductor body, or between semiconductor regions; Redistribution of impurity materials, e.g. without introduction or removal of further dopant [2006.01]

H01L 21/223 • • • • using diffusion into, or out of, a solid from or into a gaseous phase [2006.01]

H01L 21/225 • • • • using diffusion into, or out of, a solid from or into a solid phase, e.g. a doped oxide layer [2006.01]

H01L 21/228 • • • • using diffusion into, or out of, a solid from or into a liquid phase, e.g. alloy diffusion processes [2006.01]

H01L 21/24 • • • Alloying of impurity materials, e.g. doping materials, electrode materials, with a semiconductor body [2006.01]

H01L 21/26 • • • Bombardment with wave or particle radiation [2006.01]

H01L 21/261 • • • • to produce a nuclear reaction transmuting chemical elements [2006.01]

H01L 21/263 • • • • with high-energy radiation (H01L 21/261 takes precedence) [2006.01]

H01L 21/265 • • • • • producing ion implantation [2006.01]

H01L 21/266 • • • • • using masks [2006.01]

H01L 21/268 • • • • • using electromagnetic radiation, e.g. laser radiation [2006.01]

H01L 21/28 • • • Manufacture of electrodes on semiconductor bodies using processes or apparatus not provided for in groups H01L 21/20-H01L 21/268 [2006.01]

H01L 21/283 • • • • Deposition of conductive or insulating materials for electrodes [2006.01]

H01L 21/285 • • • • • from a gas or vapour, e.g. condensation [2006.01]

H01L 21/288 • • • • • from a liquid, e.g. electrolytic deposition [2006.01]

H01L 21/30 • • • Treatment of semiconductor bodies using processes or apparatus not provided for in groups H01L 21/20-H01L 21/26 (manufacture of electrodes thereon H01L 21/28) [2006.01]

H01L 21/301 • • • • to subdivide a semiconductor body into separate parts, e.g. making partitions (cutting H01L 21/304) [2006.01]

H01L 21/302 • • • • to change the physical characteristics of their surfaces, or to change their shape, e.g. etching, polishing, cutting [2006.01]

H01L 21/304 • • • • • Mechanical treatment, e.g. grinding, polishing, cutting [2006.01]

H01L 21/306 • • • • • Chemical or electrical treatment, e.g. electrolytic etching (to form insulating layers H01L 21/31; after-treatment of insulating layers H01L 21/3105) [2006.01]

H01L 21/3063 • • • • • • Electrolytic etching [2006.01]

H01L 21/3065 • • • • • • Plasma etching; Reactive-ion etching [2006.01]

H01L 21/308 • • • • • using masks (H01L 21/3063, H01L 21/3065, take precedence) [2006.01]

H01L 21/31 • • • • to form insulating layers thereon, e.g. for masking or by using photolithographic techniques (encapsulating layers H01L 21/56); After-treatment of these layers; Selection of materials for these layers [2006.01]

H01L 21/3105 • • • • • After-treatment [2006.01]

H01L 21/311 • • • • • Etching the insulating layers [2006.01]

H01L 21/3115 • • • • • Doping the insulating layers [2006.01]

H01L 21/312 • • • • • Organic layers, e.g. photoresist (H01L 21/3105, H01L 21/32 take precedence) [2006.01]

H01L 21/314 • • • • • Inorganic layers (H01L 21/3105, H01L 21/32 take precedence) [2006.01]

H01L 21/316 • • • • • composed of oxides or glassy oxides or oxide-based glass [2006.01]

H01L 21/318 • • • • • composed of nitrides [2006.01]

H01L 21/32 • • • • • using masks [2006.01]

H01L 21/3205 • • • • • Deposition of non-insulating-, e.g. conductive- or resistive-, layers, on insulating layers; After-treatment of these layers (manufacture of electrodes H01L 21/28) [2006.01]

H01L 21/321 • • • • • After-treatment [2006.01]

H01L 21/3213 • • • • • • Physical or chemical etching of the layers, e.g. to produce a patterned layer from a pre-deposited extensive layer [2006.01]

H01L 21/3215 • • • • • • Doping the layers [2006.01]

|              |                                                                                                                                                                                                                                                                                                                                                                            |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| H01L 21/322  | • • • • • to modify their internal properties, e.g. to produce internal imperfections [2006.01]                                                                                                                                                                                                                                                                            |
| H01L 21/324  | • • • • • Thermal treatment for modifying the properties of semiconductor bodies, e.g. annealing, sintering (H01L 21/20-H01L 21/288, H01L 21/302-H01L 21/322 take precedence) [2006.01]                                                                                                                                                                                    |
| H01L 21/326  | • • • • • Application of electric currents or fields, e.g. for electroforming (H01L 21/20-H01L 21/288, H01L 21/302-H01L 21/324 take precedence) [2006.01]                                                                                                                                                                                                                  |
| H01L 21/328  | • • • • • Multistep processes for the manufacture of devices of the bipolar type, e.g. diodes, transistors, thyristors [2006.01]                                                                                                                                                                                                                                           |
| H01L 21/329  | • • • • • the devices comprising one or two electrodes, e.g. diodes [2006.01]                                                                                                                                                                                                                                                                                              |
| H01L 21/33   | • • • • • the devices comprising three or more electrodes [2006.01]                                                                                                                                                                                                                                                                                                        |
| H01L 21/331  | • • • • • Transistors [2006.01]                                                                                                                                                                                                                                                                                                                                            |
| H01L 21/332  | • • • • • Thyristors [2006.01]                                                                                                                                                                                                                                                                                                                                             |
| H01L 21/334  | • • • • • Multistep processes for the manufacture of devices of the unipolar type [2006.01]                                                                                                                                                                                                                                                                                |
| H01L 21/335  | • • • • • Field-effect transistors [2006.01]                                                                                                                                                                                                                                                                                                                               |
| H01L 21/336  | • • • • • with an insulated gate [2006.01]                                                                                                                                                                                                                                                                                                                                 |
| H01L 21/337  | • • • • • with a PN junction gate [2006.01]                                                                                                                                                                                                                                                                                                                                |
| H01L 21/338  | • • • • • with a Schottky gate [2006.01]                                                                                                                                                                                                                                                                                                                                   |
| H01L 21/339  | • • • • • Charge transfer devices [2006.01]                                                                                                                                                                                                                                                                                                                                |
| H01L 21/34   | • • the devices having semiconductor bodies not provided for in groups H01L 21/06, H01L 21/16, and H01L 21/18 with or without impurities, e.g. doping materials [2006.01]                                                                                                                                                                                                  |
| H01L 21/36   | • • • • • Deposition of semiconductor materials on a substrate, e.g. epitaxial growth [2006.01]                                                                                                                                                                                                                                                                            |
| H01L 21/363  | • • • • • using physical deposition, e.g. vacuum deposition, sputtering [2006.01]                                                                                                                                                                                                                                                                                          |
| H01L 21/365  | • • • • • using reduction or decomposition of a gaseous compound yielding a solid condensate, i.e. chemical deposition [2006.01]                                                                                                                                                                                                                                           |
| H01L 21/368  | • • • • • using liquid deposition [2006.01]                                                                                                                                                                                                                                                                                                                                |
| H01L 21/38   | • • • • • Diffusion of impurity materials, e.g. doping materials, electrode materials, into, or out of, a semiconductor body, or between semiconductor regions [2006.01]                                                                                                                                                                                                   |
| H01L 21/383  | • • • • • using diffusion into, or out of, a solid from or into a gaseous phase [2006.01]                                                                                                                                                                                                                                                                                  |
| H01L 21/385  | • • • • • using diffusion into, or out of, a solid from or into a solid phase, e.g. a doped oxide layer [2006.01]                                                                                                                                                                                                                                                          |
| H01L 21/388  | • • • • • using diffusion into, or out of, a solid from or into a liquid phase, e.g. alloy diffusion processes [2006.01]                                                                                                                                                                                                                                                   |
| H01L 21/40   | • • • • • Alloying of impurity materials, e.g. doping materials, electrode materials, with a semiconductor body [2006.01]                                                                                                                                                                                                                                                  |
| H01L 21/42   | • • • • • Bombardment with radiation [2006.01]                                                                                                                                                                                                                                                                                                                             |
| H01L 21/423  | • • • • • with high-energy radiation [2006.01]                                                                                                                                                                                                                                                                                                                             |
| H01L 21/425  | • • • • • producing ion implantation [2006.01]                                                                                                                                                                                                                                                                                                                             |
| H01L 21/426  | • • • • • using masks [2006.01]                                                                                                                                                                                                                                                                                                                                            |
| H01L 21/428  | • • • • • using electromagnetic radiation, e.g. laser radiation [2006.01]                                                                                                                                                                                                                                                                                                  |
| H01L 21/44   | • • • • • Manufacture of electrodes on semiconductor bodies using processes or apparatus not provided for in groups H01L 21/36-H01L 21/428 [2006.01]                                                                                                                                                                                                                       |
| H01L 21/441  | • • • • • Deposition of conductive or insulating materials for electrodes [2006.01]                                                                                                                                                                                                                                                                                        |
| H01L 21/443  | • • • • • from a gas or vapour, e.g. condensation [2006.01]                                                                                                                                                                                                                                                                                                                |
| H01L 21/445  | • • • • • from a liquid, e.g. electrolytic deposition [2006.01]                                                                                                                                                                                                                                                                                                            |
| H01L 21/447  | • • • • • involving the application of pressure, e.g. thermo-compression bonding (H01L 21/607 takes precedence) [2006.01]                                                                                                                                                                                                                                                  |
| H01L 21/449  | • • • • • involving the application of mechanical vibrations, e.g. ultrasonic vibrations [2006.01]                                                                                                                                                                                                                                                                         |
| H01L 21/46   | • • • • • Treatment of semiconductor bodies using processes or apparatus not provided for in groups H01L 21/36-H01L 21/428 (manufacture of electrodes thereon H01L 21/44) [2006.01]                                                                                                                                                                                        |
| H01L 21/461  | • • • • • to change their surface-physical characteristics or shape, e.g. etching, polishing, cutting [2006.01]                                                                                                                                                                                                                                                            |
| H01L 21/463  | • • • • • Mechanical treatment, e.g. grinding, ultrasonic treatment [2006.01]                                                                                                                                                                                                                                                                                              |
| H01L 21/465  | • • • • • Chemical or electrical treatment, e.g. electrolytic etching (to form insulating layers H01L 21/469) [2006.01]                                                                                                                                                                                                                                                    |
| H01L 21/467  | • • • • • using masks [2006.01]                                                                                                                                                                                                                                                                                                                                            |
| H01L 21/469  | • • • • • to form insulating layers thereon, e.g. for masking or by using photolithographic techniques (encapsulating layers H01L 21/56); After-treatment of these layers [2006.01]                                                                                                                                                                                        |
| H01L 21/47   | • • • • • Organic layers, e.g. photoresist (H01L 21/475, H01L 21/4757 take precedence) [2006.01]                                                                                                                                                                                                                                                                           |
| H01L 21/471  | • • • • • Inorganic layers (H01L 21/475, H01L 21/4757 take precedence) [2006.01]                                                                                                                                                                                                                                                                                           |
| H01L 21/473  | • • • • • composed of oxides or glassy oxides or oxide-based glass [2006.01]                                                                                                                                                                                                                                                                                               |
| H01L 21/475  | • • • • • using masks [2006.01]                                                                                                                                                                                                                                                                                                                                            |
| H01L 21/4757 | • • • • • After-treatment [2006.01]                                                                                                                                                                                                                                                                                                                                        |
| H01L 21/4763 | • • • • • Deposition of non-insulating-, e.g. conductive-, resistive-, layers on insulating layers; After-treatment of these layers (manufacture of electrodes H01L 21/28) [2006.01]                                                                                                                                                                                       |
| H01L 21/477  | • • • • • Thermal treatment for modifying the properties of semiconductor bodies, e.g. annealing, sintering (H01L 21/36-H01L 21/449, H01L 21/461-H01L 21/475 take precedence) [2006.01]                                                                                                                                                                                    |
| H01L 21/479  | • • • • • Application of electric currents or fields, e.g. for electroforming (H01L 21/36-H01L 21/449, H01L 21/461-H01L 21/477 take precedence) [2006.01]                                                                                                                                                                                                                  |
| H01L 21/48   | • • • • • Manufacture or treatment of parts, e.g. containers, prior to assembly of the devices, using processes not provided for in a single one of the groups H01L 21/06-H01L 21/326 [2006.01]                                                                                                                                                                            |
| H01L 21/50   | • • • • • Assembly of semiconductor devices using processes or apparatus not provided for in a single one of the groups H01L 21/06-H01L 21/326 [2006.01]                                                                                                                                                                                                                   |
| H01L 21/52   | • • • • • Mounting semiconductor bodies in containers [2006.01]                                                                                                                                                                                                                                                                                                            |
| H01L 21/54   | • • • • • Providing fillings in containers, e.g. gas fillings [2006.01]                                                                                                                                                                                                                                                                                                    |
| H01L 21/56   | • • • • • Encapsulations, e.g. encapsulating layers, coatings [2006.01]                                                                                                                                                                                                                                                                                                    |
| H01L 21/58   | • • • • • Mounting semiconductor devices on supports [2006.01]                                                                                                                                                                                                                                                                                                             |
| H01L 21/60   | • • • • • Attaching leads or other conductive members, to be used for carrying current to or from the device in operation [2006.01]                                                                                                                                                                                                                                        |
| H01L 21/603  | • • • • • involving the application of pressure, e.g. thermo-compression bonding (H01L 21/607 takes precedence) [2006.01]                                                                                                                                                                                                                                                  |
| H01L 21/607  | • • • • • involving the application of mechanical vibrations, e.g. ultrasonic vibrations [2006.01]                                                                                                                                                                                                                                                                         |
| H01L 21/62   | • • • • • the devices having no potential-jump barriers or surface barriers [2006.01]                                                                                                                                                                                                                                                                                      |
| H01L 21/64   | • • • • • Manufacture or treatment of solid state devices other than semiconductor devices, or of parts thereof, not specially adapted for a single type of device provided for in groups H01L 31/00-H01L 51/00 [2006.01]                                                                                                                                                  |
| H01L 21/66   | • • • • • Testing or measuring during manufacture or treatment [2006.01]                                                                                                                                                                                                                                                                                                   |
| H01L 21/67   | • • • • • Apparatus specially adapted for handling semiconductor or electric solid state devices during manufacture or treatment thereof; Apparatus specially adapted for handling wafers during manufacture or treatment of semiconductor or electric solid state devices or components [2006.01]                                                                         |
| H01L 21/673  | • • • • • using specially adapted carriers [2006.01]                                                                                                                                                                                                                                                                                                                       |
| H01L 21/677  | • • • • • for conveying, e.g. between different work stations [2006.01]                                                                                                                                                                                                                                                                                                    |
| H01L 21/68   | • • • • • for positioning, orientation or alignment [2006.01]                                                                                                                                                                                                                                                                                                              |
| H01L 21/683  | • • • • • for supporting or gripping (for positioning, orientation or alignment H01L 21/68) [2006.01]                                                                                                                                                                                                                                                                      |
| H01L 21/687  | • • • • • using mechanical means, e.g. chucks, clamps or pinches [2006.01]                                                                                                                                                                                                                                                                                                 |
| H01L 21/70   | • • • • • Manufacture or treatment of devices consisting of a plurality of solid state components or integrated circuits formed in or on a common substrate or of specific parts thereof; Manufacture of integrated circuit devices or of specific parts thereof (manufacture of assemblies consisting of preformed electrical components H05K 3/00, H05K 13/00) [2006.01] |
| H01L 21/71   | • • • • • Manufacture of specific parts of devices defined in group H01L 21/70 (H01L 21/28, H01L 21/44, H01L 21/48 take precedence) [2006.01]                                                                                                                                                                                                                              |
| H01L 21/74   | • • • • • Making of buried regions of high impurity concentration, e.g. buried collector layers, internal connections [2006.01]                                                                                                                                                                                                                                            |
| H01L 21/76   | • • • • • Making of isolation regions between components [2006.01]                                                                                                                                                                                                                                                                                                         |
| H01L 21/761  | • • • • • PN junctions [2006.01]                                                                                                                                                                                                                                                                                                                                           |
| H01L 21/762  | • • • • • Dielectric regions [2006.01]                                                                                                                                                                                                                                                                                                                                     |
| H01L 21/763  | • • • • • Polycrystalline semiconductor regions [2006.01]                                                                                                                                                                                                                                                                                                                  |

|                   |                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| H01L 21/764       | •••• Air gaps [2006.01]                                                                                                                                                                                                                                                                                                                                                                |
| H01L 21/765       | •••• by field-effect [2006.01]                                                                                                                                                                                                                                                                                                                                                         |
| H01L 21/768       | •• Applying interconnections to be used for carrying current between separate components within a device [2006.01]                                                                                                                                                                                                                                                                     |
| H01L 21/77        | •• Manufacture or treatment of devices consisting of a plurality of solid state components or integrated circuits formed in, or on, a common substrate (electrically programmable read-only memories or multistep manufacturing processes therefor H01L 27/115) [2017.01]                                                                                                              |
| H01L 21/78        | •• with subsequent division of the substrate into plural individual devices (cutting to change the surface-physical characteristics or shape of semiconductor bodies H01L 21/304) [2006.01]                                                                                                                                                                                            |
| H01L 21/782       | •••• to produce devices, each consisting of a single circuit element (H01L 21/82 takes precedence) [2006.01]                                                                                                                                                                                                                                                                           |
| H01L 21/784       | •••• the substrate being a semiconductor body [2006.01]                                                                                                                                                                                                                                                                                                                                |
| H01L 21/786       | •••• the substrate being other than a semiconductor body, e.g. insulating body [2006.01]                                                                                                                                                                                                                                                                                               |
| H01L 21/82        | •••• to produce devices, e.g. integrated circuits, each consisting of a plurality of components [2006.01]                                                                                                                                                                                                                                                                              |
| H01L 21/822       | •••• the substrate being a semiconductor, using silicon technology (H01L 21/8258 takes precedence) [2006.01]                                                                                                                                                                                                                                                                           |
| H01L 21/8222      | ••••• Bipolar technology [2006.01]                                                                                                                                                                                                                                                                                                                                                     |
| H01L 21/8224      | ••••• comprising a combination of vertical and lateral transistors [2006.01]                                                                                                                                                                                                                                                                                                           |
| H01L 21/8226      | ••••• comprising merged transistor logic or integrated injection logic [2006.01]                                                                                                                                                                                                                                                                                                       |
| H01L 21/8228      | ••••• Complementary devices, e.g. complementary transistors [2006.01]                                                                                                                                                                                                                                                                                                                  |
| H01L 21/8229      | ••••• Memory structures [2006.01]                                                                                                                                                                                                                                                                                                                                                      |
| H01L 21/8232      | ••••• Field-effect technology [2006.01]                                                                                                                                                                                                                                                                                                                                                |
| H01L 21/8234      | ••••• MIS technology [2006.01]                                                                                                                                                                                                                                                                                                                                                         |
| H01L 21/8236      | ••••• Combination of enhancement and depletion transistors [2006.01]                                                                                                                                                                                                                                                                                                                   |
| H01L 21/8238      | ••••• Complementary field-effect transistors, e.g. CMOS [2006.01]                                                                                                                                                                                                                                                                                                                      |
| H01L 21/8239      | ••••• Memory structures [2006.01]                                                                                                                                                                                                                                                                                                                                                      |
| H01L 21/8242      | ••••• Dynamic random access memory structures (DRAM) [2006.01]                                                                                                                                                                                                                                                                                                                         |
| H01L 21/8244      | ••••• Static random access memory structures (SRAM) [2006.01]                                                                                                                                                                                                                                                                                                                          |
| H01L 21/8246      | ••••• Read-only memory structures (ROM) [2006.01]                                                                                                                                                                                                                                                                                                                                      |
| H01L 21/8247      | (transferred to H01L 27/115-H01L 27/11597)                                                                                                                                                                                                                                                                                                                                             |
| H01L 21/8248      | ••••• Combination of bipolar and field-effect technology [2006.01]                                                                                                                                                                                                                                                                                                                     |
| H01L 21/8249      | ••••• Bipolar and MOS technology [2006.01]                                                                                                                                                                                                                                                                                                                                             |
| H01L 21/8252      | •••• the substrate being a semiconductor, using III-V technology (H01L 21/8258 takes precedence) [2006.01]                                                                                                                                                                                                                                                                             |
| H01L 21/8254      | •••• the substrate being a semiconductor, using II-VI technology (H01L 21/8258 takes precedence) [2006.01]                                                                                                                                                                                                                                                                             |
| H01L 21/8256      | •••• the substrate being a semiconductor, using technologies not covered by one of groups H01L 21/822, H01L 21/8252 or H01L 21/8254 (H01L 21/8258 takes precedence) [2006.01]                                                                                                                                                                                                          |
| H01L 21/8258      | •••• the substrate being a semiconductor, using a combination of technologies covered by H01L 21/822, H01L 21/8252, H01L 21/8254 or H01L 21/8256 [2006.01]                                                                                                                                                                                                                             |
| H01L 21/84        | •••• the substrate being other than a semiconductor body, e.g. being an insulating body [2006.01]                                                                                                                                                                                                                                                                                      |
| H01L 21/86        | ••••• the insulating body being sapphire, e.g. silicon on sapphire structure, i.e. SOS [2006.01]                                                                                                                                                                                                                                                                                       |
| H01L 21/98        | •• Assembly of devices consisting of solid state components formed in or on a common substrate; Assembly of integrated circuit devices (H01L 21/50 takes precedence) [2006.01]                                                                                                                                                                                                         |
| <b>H01L 23/00</b> | <b>Details of semiconductor or other solid state devices (H01L 25/00 takes precedence) [2006.01]</b>                                                                                                                                                                                                                                                                                   |
|                   | Note(s)                                                                                                                                                                                                                                                                                                                                                                                |
|                   | • This group <b>does not cover</b> : <ul style="list-style-type: none"> <li>• details of semiconductor bodies or of electrodes of devices provided for in group H01L 29/00, which details are covered by that group;</li> <li>• details peculiar to devices provided for in a single main group of groups H01L 31/00-H01L 51/00, which details are covered by those groups.</li> </ul> |
| H01L 23/02        | • Containers; Seals (H01L 23/12, H01L 23/34, H01L 23/48, H01L 23/552 take precedence) [2006.01]                                                                                                                                                                                                                                                                                        |
| H01L 23/04        | • characterised by the shape [2006.01]                                                                                                                                                                                                                                                                                                                                                 |
| H01L 23/043       | •• the container being a hollow construction and having a conductive base as a mounting as well as a lead for the semiconductor body [2006.01]                                                                                                                                                                                                                                         |
| H01L 23/045       | ••• the other leads having an insulating passage through the base [2006.01]                                                                                                                                                                                                                                                                                                            |
| H01L 23/047       | ••• the other leads being parallel to the base [2006.01]                                                                                                                                                                                                                                                                                                                               |
| H01L 23/049       | ••• the other leads being perpendicular to the base [2006.01]                                                                                                                                                                                                                                                                                                                          |
| H01L 23/051       | ••• another lead being formed by a cover plate parallel to the base plate, e.g. sandwich type [2006.01]                                                                                                                                                                                                                                                                                |
| H01L 23/053       | •• the container being a hollow construction and having an insulating base as a mounting for the semiconductor body [2006.01]                                                                                                                                                                                                                                                          |
| H01L 23/055       | ••• the leads having a passage through the base [2006.01]                                                                                                                                                                                                                                                                                                                              |
| H01L 23/057       | ••• the leads being parallel to the base [2006.01]                                                                                                                                                                                                                                                                                                                                     |
| H01L 23/06        | • characterised by the material of the container or its electrical properties [2006.01]                                                                                                                                                                                                                                                                                                |
| H01L 23/08        | •• the material being an electrical insulator, e.g. glass [2006.01]                                                                                                                                                                                                                                                                                                                    |
| H01L 23/10        | • characterised by the material or arrangement of seals between parts, e.g. between cap and base of the container or between leads and walls of the container [2006.01]                                                                                                                                                                                                                |
| H01L 23/12        | • Mountings, e.g. non-detachable insulating substrates [2006.01]                                                                                                                                                                                                                                                                                                                       |
| H01L 23/13        | • characterised by the shape [2006.01]                                                                                                                                                                                                                                                                                                                                                 |
| H01L 23/14        | • characterised by the material or its electrical properties [2006.01]                                                                                                                                                                                                                                                                                                                 |
| H01L 23/15        | •• Ceramic or glass substrates [2006.01]                                                                                                                                                                                                                                                                                                                                               |
| H01L 23/16        | • Fillings or auxiliary members in containers, e.g. centering rings (H01L 23/42, H01L 23/552 take precedence) [2006.01]                                                                                                                                                                                                                                                                |
| H01L 23/18        | • Fillings characterised by the material, its physical or chemical properties, or its arrangement within the complete device [2006.01]                                                                                                                                                                                                                                                 |
|                   | Note(s) [2]                                                                                                                                                                                                                                                                                                                                                                            |
|                   | • Group H01L 23/26 takes precedence over groups H01L 23/20-H01L 23/24.                                                                                                                                                                                                                                                                                                                 |
| H01L 23/20        | •• gaseous at the normal operating temperature of the device [2006.01]                                                                                                                                                                                                                                                                                                                 |
| H01L 23/22        | •• liquid at the normal operating temperature of the device [2006.01]                                                                                                                                                                                                                                                                                                                  |
| H01L 23/24        | •• solid or gel, at the normal operating temperature of the device [2006.01]                                                                                                                                                                                                                                                                                                           |
| H01L 23/26        | •• including materials for absorbing or reacting with moisture or other undesired substances [2006.01]                                                                                                                                                                                                                                                                                 |
| H01L 23/28        | • Encapsulation, e.g. encapsulating layers, coatings (H01L 23/552 takes precedence) [2006.01]                                                                                                                                                                                                                                                                                          |
| H01L 23/29        | • characterised by the material [2006.01]                                                                                                                                                                                                                                                                                                                                              |
| H01L 23/31        | • characterised by the arrangement [2006.01]                                                                                                                                                                                                                                                                                                                                           |
| H01L 23/32        | • Holders for supporting the complete device in operation, i.e. detachable fixtures (H01L 23/40 takes precedence) [2006.01]                                                                                                                                                                                                                                                            |
| H01L 23/34        | • Arrangements for cooling, heating, ventilating or temperature compensation [2006.01]                                                                                                                                                                                                                                                                                                 |
| H01L 23/36        | •• Selection of materials, or shaping, to facilitate cooling or heating, e.g. heat sinks [2006.01]                                                                                                                                                                                                                                                                                     |
| H01L 23/367       | ••• Cooling facilitated by shape of device [2006.01]                                                                                                                                                                                                                                                                                                                                   |
| H01L 23/373       | ••• Cooling facilitated by selection of materials for the device [2006.01]                                                                                                                                                                                                                                                                                                             |
| H01L 23/38        | •• Cooling arrangements using the Peltier effect [2006.01]                                                                                                                                                                                                                                                                                                                             |
| H01L 23/40        | • Mountings or securing means for detachable cooling or heating arrangements [2006.01]                                                                                                                                                                                                                                                                                                 |
| H01L 23/42        | •• Fillings or auxiliary members in containers selected or arranged to facilitate heating or cooling [2006.01]                                                                                                                                                                                                                                                                         |
| H01L 23/427       | ••• Cooling by change of state, e.g. use of heat pipes [2006.01]                                                                                                                                                                                                                                                                                                                       |
| H01L 23/433       | ••• Auxiliary members characterised by their shape, e.g. pistons [2006.01]                                                                                                                                                                                                                                                                                                             |
| H01L 23/44        | •• the complete device being wholly immersed in a fluid other than air (H01L 23/427 takes precedence) [2006.01]                                                                                                                                                                                                                                                                        |

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| H01L 23/46        | • • involving the transfer of heat by flowing fluids (H01L 23/42, H01L 23/44 take precedence) [2006.01]                                                                                                                                                                                            |
| H01L 23/467       | • • • by flowing gases, e.g. air [2006.01]                                                                                                                                                                                                                                                         |
| H01L 23/473       | • • • by flowing liquids [2006.01]                                                                                                                                                                                                                                                                 |
| H01L 23/48        | • Arrangements for conducting electric current to or from the solid state body in operation, e.g. leads or terminal arrangements [2006.01]                                                                                                                                                         |
| H01L 23/482       | • • consisting of lead-in layers inseparably applied to the semiconductor body [2006.01]                                                                                                                                                                                                           |
| H01L 23/485       | • • • consisting of layered constructions comprising conductive layers and insulating layers, e.g. planar contacts [2006.01]                                                                                                                                                                       |
| H01L 23/488       | • • • consisting of soldered or bonded constructions [2006.01]                                                                                                                                                                                                                                     |
| H01L 23/49        | • • • wire-like [2006.01]                                                                                                                                                                                                                                                                          |
| H01L 23/492       | • • • Bases or plates [2006.01]                                                                                                                                                                                                                                                                    |
| H01L 23/495       | • • • Lead-frames [2006.01]                                                                                                                                                                                                                                                                        |
| H01L 23/498       | • • • Leads on insulating substrates [2006.01]                                                                                                                                                                                                                                                     |
| H01L 23/50        | • • for integrated circuit devices (H01L 23/482-H01L 23/498 take precedence) [2006.01]                                                                                                                                                                                                             |
| H01L 23/52        | • Arrangements for conducting electric current within the device in operation from one component to another [2006.01]                                                                                                                                                                              |
| H01L 23/522       | • • including external interconnections consisting of a multilayer structure of conductive and insulating layers inseparably formed on the semiconductor body [2006.01]                                                                                                                            |
| H01L 23/525       | • • • with adaptable interconnections [2006.01]                                                                                                                                                                                                                                                    |
| H01L 23/528       | • • • Layout of the interconnection structure [2006.01]                                                                                                                                                                                                                                            |
| H01L 23/532       | • • • characterised by the materials [2006.01]                                                                                                                                                                                                                                                     |
| H01L 23/535       | • • • including internal interconnections, e.g. cross-under constructions [2006.01]                                                                                                                                                                                                                |
| H01L 23/538       | • • • the interconnection structure between a plurality of semiconductor chips being formed on, or in, insulating substrates [2006.01]                                                                                                                                                             |
| H01L 23/544       | • Marks applied to semiconductor devices, e.g. registration marks, test patterns [2006.01]                                                                                                                                                                                                         |
| H01L 23/552       | • Protection against radiation, e.g. light [2006.01]                                                                                                                                                                                                                                               |
| H01L 23/556       | • • against alpha rays [2006.01]                                                                                                                                                                                                                                                                   |
| H01L 23/58        | • Structural electrical arrangements for semiconductor devices not otherwise provided for [2006.01]                                                                                                                                                                                                |
| H01L 23/60        | • • Protection against electrostatic charges or discharges, e.g. Faraday shields [2006.01]                                                                                                                                                                                                         |
| H01L 23/62        | • • Protection against overcurrent or overload, e.g. fuses, shunts [2006.01]                                                                                                                                                                                                                       |
| H01L 23/64        | • • Impedance arrangements [2006.01]                                                                                                                                                                                                                                                               |
| H01L 23/66        | • • • High-frequency adaptations [2006.01]                                                                                                                                                                                                                                                         |
| <b>H01L 25/00</b> | <b>Assemblies consisting of a plurality of individual semiconductor or other solid state devices</b> (devices consisting of a plurality of solid state components formed in or on a common substrate H01L 27/00; photovoltaic modules or arrays of photovoltaic cells H01L 31/042) [2006.01]       |
| H01L 25/03        | • all the devices being of a type provided for in the same subgroup of groups H01L 27/00-H01L 51/00, e.g. assemblies of rectifier diodes [2006.01]                                                                                                                                                 |
| H01L 25/04        | • • the devices not having separate containers [2014.01]                                                                                                                                                                                                                                           |
| H01L 25/065       | • • • the devices being of a type provided for in group H01L 27/00 [2006.01]                                                                                                                                                                                                                       |
| H01L 25/07        | • • • the devices being of a type provided for in group H01L 29/00 [2006.01]                                                                                                                                                                                                                       |
| H01L 25/075       | • • • the devices being of a type provided for in group H01L 33/00 [2006.01]                                                                                                                                                                                                                       |
| H01L 25/10        | • • the devices having separate containers [2006.01]                                                                                                                                                                                                                                               |
| H01L 25/11        | • • • the devices being of a type provided for in group H01L 29/00 [2006.01]                                                                                                                                                                                                                       |
| H01L 25/13        | • • • the devices being of a type provided for in group H01L 33/00 [2006.01]                                                                                                                                                                                                                       |
| H01L 25/16        | • the devices being of types provided for in two or more different main groups of groups H01L 27/00-H01L 51/00, e.g. forming hybrid circuits [2006.01]                                                                                                                                             |
| H01L 25/18        | • the devices being of types provided for in two or more different subgroups of the same main group of groups H01L 27/00-H01L 51/00 [2006.01]                                                                                                                                                      |
| <b>H01L 27/00</b> | <b>Devices consisting of a plurality of semiconductor or other solid-state components formed in or on a common substrate</b> (details thereof H01L 23/00, H01L 29/00-H01L 51/00; assemblies consisting of a plurality of individual solid state devices H01L 25/00) [2006.01]                      |
|                   | Note(s) [2017.01]                                                                                                                                                                                                                                                                                  |
|                   | 1. In this group, with the exception of groups H01L 27/115-H01L 27/11597, the last place priority rule is applied, i.e. at each hierarchical level, in the absence of an indication to the contrary, classification is made in the last appropriate place.                                         |
|                   | 2. When classifying in this group, subject matter relating to electrically programmable read-only memories is classified in group H01L 27/115, irrespective of the last place priority rule.                                                                                                       |
| H01L 27/01        | • comprising only passive thin-film or thick-film elements formed on a common insulating substrate [2006.01]                                                                                                                                                                                       |
| H01L 27/02        | • including semiconductor components specially adapted for rectifying, oscillating, amplifying or switching and having at least one potential-jump barrier or surface barrier; including integrated passive circuit elements with at least one potential-jump barrier or surface barrier [2006.01] |
| H01L 27/04        | • • the substrate being a semiconductor body [2006.01]                                                                                                                                                                                                                                             |
| H01L 27/06        | • • • including a plurality of individual components in a non-repetitive configuration [2006.01]                                                                                                                                                                                                   |
| H01L 27/07        | • • • • the components having an active region in common [2006.01]                                                                                                                                                                                                                                 |
| H01L 27/08        | • • • including only semiconductor components of a single kind [2006.01]                                                                                                                                                                                                                           |
| H01L 27/082       | • • • • including bipolar components only [2006.01]                                                                                                                                                                                                                                                |
| H01L 27/085       | • • • • including field-effect components only [2006.01]                                                                                                                                                                                                                                           |
| H01L 27/088       | • • • • • the components being field-effect transistors with insulated gate [2006.01]                                                                                                                                                                                                              |
| H01L 27/092       | • • • • • • complementary MIS field-effect transistors [2006.01]                                                                                                                                                                                                                                   |
| H01L 27/095       | • • • • • the components being Schottky barrier gate field-effect transistors [2006.01]                                                                                                                                                                                                            |
| H01L 27/098       | • • • • • the components being PN junction gate field-effect transistors [2006.01]                                                                                                                                                                                                                 |
| H01L 27/10        | • • • including a plurality of individual components in a repetitive configuration [2006.01]                                                                                                                                                                                                       |
| H01L 27/102       | • • • • including bipolar components [2006.01]                                                                                                                                                                                                                                                     |
| H01L 27/105       | • • • • including field-effect components [2006.01]                                                                                                                                                                                                                                                |
| H01L 27/108       | • • • • • Dynamic random access memory structures [2006.01]                                                                                                                                                                                                                                        |
| H01L 27/11        | • • • • • Static random access memory structures [2006.01]                                                                                                                                                                                                                                         |
| H01L 27/112       | • • • • • Read-only memory structures [2006.01]                                                                                                                                                                                                                                                    |
| H01L 27/115       | • • • • • Electrically programmable read-only memories; Multistep manufacturing processes therefor [2017.01]                                                                                                                                                                                       |
| H01L 27/11502     | • • • • • • with ferroelectric memory capacitors [2017.01]                                                                                                                                                                                                                                         |
| H01L 27/11504     | • • • • • • • characterised by the top-view layout [2017.01]                                                                                                                                                                                                                                       |
| H01L 27/11507     | • • • • • • • characterised by the memory core region [2017.01]                                                                                                                                                                                                                                    |
| H01L 27/11509     | • • • • • • • characterised by the peripheral circuit region [2017.01]                                                                                                                                                                                                                             |
| H01L 27/11512     | • • • • • • • characterised by the boundary region between the core and peripheral circuit regions [2017.01]                                                                                                                                                                                       |
| H01L 27/11514     | • • • • • • • characterised by the three-dimensional arrangements, e.g. with cells on different height levels [2017.01]                                                                                                                                                                            |
| H01L 27/11517     | • • • • • • • with floating gate [2017.01]                                                                                                                                                                                                                                                         |
| H01L 27/11519     | • • • • • • • characterised by the top-view layout [2017.01]                                                                                                                                                                                                                                       |
| H01L 27/11521     | • • • • • • • characterised by the memory core region (three-dimensional arrangements H01L 27/11551) [2017.01]                                                                                                                                                                                     |
| H01L 27/11524     | • • • • • • • with cell select transistors, e.g. NAND [2017.01]                                                                                                                                                                                                                                    |
| H01L 27/11526     | • • • • • • • characterised by the peripheral circuit region [2017.01]                                                                                                                                                                                                                             |
| H01L 27/11529     | • • • • • • • of memory regions comprising cell select transistors, e.g. NAND [2017.01]                                                                                                                                                                                                            |

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| H01L 27/11531     | • • • • • Simultaneous manufacturing of periphery and memory cells [2017.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| H01L 27/11534     | • • • • • including only one type of peripheral transistor [2017.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| H01L 27/11536     | • • • • • with a control gate layer also being used as part of the peripheral transistor [2017.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| H01L 27/11539     | • • • • • with an inter-gate dielectric layer also being used as part of the peripheral transistor [2017.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| H01L 27/11541     | • • • • • with a floating-gate layer also being used as part of the peripheral transistor [2017.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| H01L 27/11543     | • • • • • with a tunnel dielectric layer also being used as part of the peripheral transistor [2017.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| H01L 27/11546     | • • • • • including different types of peripheral transistor [2017.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| H01L 27/11548     | • • • • • characterised by the boundary region between the core and peripheral circuit regions [2017.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| H01L 27/11551     | • • • • • characterised by three-dimensional arrangements, e.g. with cells on different height levels [2017.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| H01L 27/11553     | • • • • • with source and drain on different levels, e.g. with sloping channels [2017.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| H01L 27/11556     | • • • • • the channels comprising vertical portions, e.g. U-shaped channels [2017.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| H01L 27/11558     | • • • • • the control gate being a doped region, e.g. single-poly memory cells [2017.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| H01L 27/1156      | • • • • • the floating gate being an electrode shared by two or more components [2017.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| H01L 27/11563     | • • • • • with charge-trapping gate insulators, e.g. MNOS or NROM [2017.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| H01L 27/11565     | • • • • • characterised by the top-view layout [2017.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| H01L 27/11568     | • • • • • characterised by the memory core region (three-dimensional arrangements H01L 27/11578) [2017.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| H01L 27/1157      | • • • • • with cell select transistors, e.g. NAND [2017.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| H01L 27/11573     | • • • • • characterised by the peripheral circuit region [2017.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| H01L 27/11575     | • • • • • characterised by the boundary region between the core and peripheral circuit regions [2017.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| H01L 27/11578     | • • • • • characterised by three-dimensional arrangements, e.g. with cells on different height levels [2017.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| H01L 27/1158      | • • • • • with source and drain on different levels, e.g. with sloping channels [2017.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| H01L 27/11582     | • • • • • the channels comprising vertical portions, e.g. U-shaped channels [2017.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| H01L 27/11585     | • • • • • with the gate electrodes comprising a layer used for its ferroelectric memory properties, e.g. metal-ferroelectric-semiconductor [MFS] or metal-ferroelectric-metal-insulator-semiconductor [MFMS] [2017.01]                                                                                                                                                                                                                                                                                                                                                                                                                         |
| H01L 27/11587     | • • • • • characterised by the top-view layout [2017.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| H01L 27/1159      | • • • • • characterised by the memory core region [2017.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| H01L 27/11592     | • • • • • characterised by the peripheral circuit region [2017.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| H01L 27/11595     | • • • • • characterised by the boundary region between core and peripheral circuit regions [2017.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| H01L 27/11597     | • • • • • characterised by three-dimensional arrangements, e.g. cells on different height levels [2017.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| H01L 27/118       | • • • Masterslice integrated circuits [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| H01L 27/12        | • • • the substrate being other than a semiconductor body, e.g. an insulating body [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| H01L 27/13        | • • • combined with thin-film or thick-film passive components [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| H01L 27/14        | • including semiconductor components sensitive to infra-red radiation, light, electromagnetic radiation of shorter wavelength or corpuscular radiation and specially adapted either for the conversion of the energy of such radiation into electrical energy or for the control of electrical energy by such radiation (radiation-sensitive components structurally associated with one or more electric light sources only H01L 31/14; couplings of light guides with optoelectronic elements G02B 6/42) [2006.01]                                                                                                                           |
| H01L 27/142       | • • Energy conversion devices (photovoltaic modules or arrays of single photovoltaic cells comprising bypass diodes integrated or directly associated with the devices H01L 31/0443; photovoltaic modules composed of a plurality of thin film solar cells deposited on the same substrate H01L 31/046) [2014.01]                                                                                                                                                                                                                                                                                                                              |
| H01L 27/144       | • • Devices controlled by radiation [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| H01L 27/146       | • • • Imager structures [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| H01L 27/148       | • • • Charge coupled imagers [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| H01L 27/15        | • including semiconductor components with at least one potential-jump barrier or surface barrier, specially adapted for light emission [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| H01L 27/16        | • including thermoelectric components with or without a junction of dissimilar materials; including thermomagnetic components (using the Peltier effect only for cooling of semiconductor or other solid state devices H01L 23/38) [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                   |
| H01L 27/18        | • including components exhibiting superconductivity [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| H01L 27/20        | • including piezo-electric components; including electrostrictive components; including magnetostrictive components [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| H01L 27/22        | • including components using galvano-magnetic effects, e.g. Hall effect; using similar magnetic field effects [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| H01L 27/24        | • including solid state components for rectifying, amplifying, or switching without a potential-jump barrier or surface barrier [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| H01L 27/26        | • including bulk negative resistance effect components [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| H01L 27/28        | • including components using organic materials as the active part, or using a combination of organic materials with other materials as the active part [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| H01L 27/30        | • • with components specially adapted for sensing infra-red radiation, light, electromagnetic radiation of shorter wavelength, or corpuscular radiation; with components specially adapted for either the conversion of the energy of such radiation into electrical energy or for the control of electrical energy by such radiation [2006.01]                                                                                                                                                                                                                                                                                                |
| H01L 27/32        | • • with components specially adapted for light emission, e.g. flat-panel displays using organic light-emitting diodes [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>H01L 29/00</b> | <b>Semiconductor devices specially adapted for rectifying, amplifying, oscillating or switching and having at least one potential-jump barrier or surface barrier; Capacitors or resistors with at least one potential-jump barrier or surface barrier, e.g. PN-junction depletion layer or carrier concentration layer; Details of semiconductor bodies or of electrodes thereof (H01L 31/00-H01L 47/00, H01L 51/05 take precedence; details other than of semiconductor bodies or of electrodes thereof H01L 23/00; devices consisting of a plurality of solid state components formed in or on a common substrate H01L 27/00) [2006.01]</b> |
|                   | Note(s) [2]<br>• In this main group, classification is made in all of groups H01L 29/02, H01L 29/40 and H01L 29/66 if all of these groups are relevant.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| H01L 29/02        | • Semiconductor bodies [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| H01L 29/04        | • • characterised by their crystalline structure, e.g. polycrystalline, cubic or particular orientation of crystalline planes (characterised by physical imperfections H01L 29/30) [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| H01L 29/06        | • • characterised by their shape; characterised by the shapes, relative sizes, or dispositions of the semiconductor regions [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| H01L 29/08        | • • with semiconductor regions connected to an electrode carrying current to be rectified, amplified, or switched and such electrode being part of a semiconductor device which comprises three or more electrodes [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                   |
| H01L 29/10        | • • with semiconductor regions connected to an electrode not carrying current to be rectified, amplified, or switched and such electrode being part of a semiconductor device which comprises three or more electrodes [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                               |
| H01L 29/12        | • • characterised by the materials of which they are formed [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| H01L 29/15        | • • Structures with periodic or quasi periodic potential variation, e.g. multiple quantum wells, superlattices (such structures applied for the control of light G02F 1/017; applied in semiconductor lasers H01S 5/34) [2006.01]<br>Note(s) [6]<br>• Group H01L 29/15 takes precedence over groups H01L 29/16-H01L 29/26.                                                                                                                                                                                                                                                                                                                     |
| H01L 29/16        | • • • including, apart from doping materials or other impurities, only elements of Group IV of the Periodic System in uncombined form [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| H01L 29/161       | • • • including two or more of the elements provided for in group H01L 29/16 [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| H01L 29/165       | • • • in different semiconductor regions [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| H01L 29/167       | • • • further characterised by the doping material [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| H01L 29/18        | • • • Selenium or tellurium only, apart from doping materials or other impurities [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| H01L 29/20        | • • • including, apart from doping materials or other impurities, only A <sub>III</sub> B <sub>V</sub> compounds [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| H01L 29/201       | • • • including two or more compounds [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| H01L 29/205       | • • • in different semiconductor regions [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| H01L 29/207       | • • • further characterised by the doping material [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| H01L 29/22        | • • • including, apart from doping materials or other impurities, only $A_{III}B_{VI}$ compounds [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| H01L 29/221       | • • • • including two or more compounds [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| H01L 29/225       | • • • • • in different semiconductor regions [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| H01L 29/227       | • • • • • further characterised by the doping material [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| H01L 29/24        | • • • including, apart from doping materials or other impurities, only inorganic semiconductor materials not provided for in groups H01L 29/16, H01L 29/18, H01L 29/20 or H01L 29/22 [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| H01L 29/26        | • • • including, apart from doping materials or other impurities, elements provided for in two or more of the groups H01L 29/16, H01L 29/18, H01L 29/20, H01L 29/22, H01L 29/24 [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| H01L 29/267       | • • • • in different semiconductor regions [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| H01L 29/30        | • • characterised by physical imperfections; having polished or roughened surface [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| H01L 29/32        | • • • the imperfections being within the semiconductor body [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| H01L 29/34        | • • • the imperfections being on the surface [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| H01L 29/36        | • • characterised by the concentration or distribution of impurities [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| H01L 29/38        | • • characterised by combination of features provided for in two or more of the groups H01L 29/04, H01L 29/06, H01L 29/12, H01L 29/30, H01L 29/36 [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| H01L 29/40        | • Electrodes [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| H01L 29/41        | • • characterised by their shape, relative sizes or dispositions [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| H01L 29/417       | • • • carrying the current to be rectified, amplified or switched [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| H01L 29/423       | • • • not carrying the current to be rectified, amplified or switched [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| H01L 29/43        | • • characterised by the materials of which they are formed [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| H01L 29/45        | • • • Ohmic electrodes [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| H01L 29/47        | • • • Schottky barrier electrodes [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| H01L 29/49        | • • • Metal-insulator semiconductor electrodes [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| H01L 29/51        | • • • • Insulating materials associated therewith [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| H01L 29/66        | • Types of semiconductor device [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| H01L 29/68        | • • controllable by only the electric current supplied, or only the electric potential applied, to an electrode which does not carry the current to be rectified, amplified, or switched (H01L 29/96 takes precedence) [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| H01L 29/70        | • • • Bipolar devices [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| H01L 29/72        | • • • • Transistor-type devices, i.e. able to continuously respond to applied control signals [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| H01L 29/73        | • • • • • Bipolar junction transistors [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| H01L 29/732       | • • • • • • Vertical transistors [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| H01L 29/735       | • • • • • • Lateral transistors [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| H01L 29/737       | • • • • • • Hetero-junction transistors [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| H01L 29/739       | • • • • • controlled by field effect [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| H01L 29/74        | • • • Thyristor-type devices, e.g. having four-zone regenerative action [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| H01L 29/744       | • • • • Gate-turn-off devices [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| H01L 29/745       | • • • • • with turn-off by field effect [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| H01L 29/747       | • • • • • Bidirectional devices, e.g. triacs [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| H01L 29/749       | • • • • • with turn-on by field effect [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| H01L 29/76        | • • Unipolar devices [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| H01L 29/762       | • • • Charge transfer devices [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| H01L 29/765       | • • • • Charge-coupled devices [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| H01L 29/768       | • • • • • with field effect produced by an insulated gate [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| H01L 29/772       | • • • • Field-effect transistors [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| H01L 29/775       | • • • • • with one-dimensional charge carrier gas channel, e.g. quantum wire FET [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| H01L 29/778       | • • • • • with two-dimensional charge carrier gas channel, e.g. HEMT [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| H01L 29/78        | • • • • • with field effect produced by an insulated gate [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| H01L 29/786       | • • • • • Thin-film transistors [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| H01L 29/788       | • • • • • • with floating gate [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| H01L 29/792       | • • • • • • with charge trapping gate insulator, e.g. MNOS-memory transistor [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| H01L 29/80        | • • • • • with field effect produced by a PN or other rectifying junction gate [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| H01L 29/808       | • • • • • • with a PN junction gate [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| H01L 29/812       | • • • • • • with a Schottky gate [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| H01L 29/82        | • • controllable by variation of the magnetic field applied to the device (H01L 29/96 takes precedence) [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| H01L 29/84        | • • controllable by variation of applied mechanical force, e.g. of pressure (H01L 29/96 takes precedence) [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| H01L 29/86        | • • controllable only by variation of the electric current supplied, or only the electric potential applied, to one or more of the electrodes carrying the current to be rectified, amplified, oscillated, or switched (H01L 29/96 takes precedence) [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| H01L 29/8605      | • • • Resistors with PN junction [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| H01L 29/861       | • • Diodes [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| H01L 29/862       | • • • Point contact diodes [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| H01L 29/864       | • • • • Transit-time diodes, e.g. IMPATT, TRAPATT diodes [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| H01L 29/866       | • • • • Zener diodes [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| H01L 29/868       | • • • • PIN diodes [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| H01L 29/87        | • • • • Thyristor diodes, e.g. Shockley diodes, break-over diodes [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| H01L 29/872       | • • • • Schottky diodes [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| H01L 29/88        | • • • • Tunnel-effect diodes [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| H01L 29/885       | • • • • • Esaki diodes [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| H01L 29/92        | • • Capacitors with potential-jump barrier or surface barrier [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| H01L 29/93        | • • • Variable-capacitance diodes, e.g. varactors [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| H01L 29/94        | • • • • Metal-insulator-semiconductors, e.g. MOS [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| H01L 29/96        | • • of a type covered by more than one of groups H01L 29/68, H01L 29/82, H01L 29/84 or H01L 29/86 [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>H01L 31/00</b> | <b>Semiconductor devices sensitive to infra-red radiation, light, electromagnetic radiation of shorter wavelength, or corpuscular radiation and specially adapted either for the conversion of the energy of such radiation into electrical energy or for the control of electrical energy by such radiation; Processes or apparatus specially adapted for the manufacture or treatment thereof or of parts thereof; Details thereof (H01L 51/42 takes precedence; devices consisting of a plurality of solid state components formed in, or on, a common substrate, other than combinations of radiation-sensitive components with one or more electric light sources, H01L 27/00) [2006.01]</b> |
| H01L 31/02        | • Details [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| H01L 31/0203      | • • Containers; Encapsulations (for photovoltaic devices H01L 31/048; for organic photosensitive devices H01L 51/44) [2014.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| H01L 31/0216      | • • Coatings (H01L 31/041 takes precedence) [2014.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| H01L 31/0224      | • • Electrodes [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| H01L 31/0232      | • • Optical elements or arrangements associated with the device (H01L 31/0236 takes precedence; for photovoltaic cells H01L 31/054; for photovoltaic modules H02S 40/20) [2014.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
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| H01L 31/0236 | • • Special surface textures [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| H01L 31/024  | • • Arrangements for cooling, heating, ventilating or temperature compensation (for photovoltaic devices H01L 31/052) [2014.01]                                                                                                                                                                                                                                                                                                                                                         |
| H01L 31/0248 | • characterised by their semiconductor bodies [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| H01L 31/0256 | • • characterised by the material [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| H01L 31/0264 | • • • Inorganic materials [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| H01L 31/0272 | • • • • Selenium or tellurium [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| H01L 31/028  | • • • • including, apart from doping material or other impurities, only elements of Group IV of the Periodic System [2006.01]                                                                                                                                                                                                                                                                                                                                                           |
| H01L 31/0288 | • • • • characterised by the doping material [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| H01L 31/0296 | • • • • including, apart from doping material or other impurities, only $A_{III}B_{VI}$ compounds, e.g. CdS, ZnS, HgCdTe [2006.01]                                                                                                                                                                                                                                                                                                                                                      |
| H01L 31/0304 | • • • • including, apart from doping materials or other impurities, only $A_{III}B_{IV}$ compounds [2006.01]                                                                                                                                                                                                                                                                                                                                                                            |
| H01L 31/0312 | • • • • including, apart from doping materials or other impurities, only $A_{IV}B_{IV}$ compounds, e.g. SiC [2006.01]                                                                                                                                                                                                                                                                                                                                                                   |
| H01L 31/032  | • • • • including, apart from doping materials or other impurities, only compounds not provided for in groups H01L 31/0272-H01L 31/0312 [2006.01]                                                                                                                                                                                                                                                                                                                                       |
| H01L 31/0328 | • • • • including, apart from doping materials or other impurities, semiconductor materials provided for in two or more of groups H01L 31/0272-H01L 31/032 [2006.01]                                                                                                                                                                                                                                                                                                                    |
| H01L 31/0336 | • • • • in different semiconductor regions, e.g. $Cu_2X/CdX$ hetero-junctions, X being an element of Group VI of the Periodic System [2006.01]                                                                                                                                                                                                                                                                                                                                          |
| H01L 31/0352 | • • characterised by their shape or by the shapes, relative sizes or disposition of the semiconductor regions [2006.01]                                                                                                                                                                                                                                                                                                                                                                 |
| H01L 31/036  | • • characterised by their crystalline structure or particular orientation of the crystalline planes [2006.01]                                                                                                                                                                                                                                                                                                                                                                          |
| H01L 31/0368 | • • • including polycrystalline semiconductors (H01L 31/0392 takes precedence) [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                |
| H01L 31/0376 | • • • including amorphous semiconductors (H01L 31/0392 takes precedence) [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                      |
| H01L 31/0384 | • • • including other non-monocrystalline materials, e.g. semiconductor particles embedded in an insulating material (H01L 31/0392 takes precedence) [2006.01]                                                                                                                                                                                                                                                                                                                          |
| H01L 31/0392 | • • • including thin films deposited on metallic or insulating substrates [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                     |
| H01L 31/04   | • adapted as photovoltaic [PV] conversion devices (testing thereof during manufacture H01L 21/66; testing thereof after manufacture H02S 50/10) [2014.01]                                                                                                                                                                                                                                                                                                                               |
| H01L 31/041  | • • Provisions for preventing damage caused by corpuscular radiation, e.g. for space applications [2014.01]                                                                                                                                                                                                                                                                                                                                                                             |
| H01L 31/042  | • • PV modules or arrays of single PV cells (supporting structures for PV modules H02S 20/00) [2014.01]                                                                                                                                                                                                                                                                                                                                                                                 |
| H01L 31/043  | • • • Mechanically stacked PV cells [2014.01]                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| H01L 31/044  | • • • including bypass diodes (bypass diodes in the junction box H02S 40/34) [2014.01]                                                                                                                                                                                                                                                                                                                                                                                                  |
| H01L 31/0443 | • • • • comprising bypass diodes integrated or directly associated with the devices, e.g. bypass diodes integrated or formed in or on the same substrate as the photovoltaic cells [2014.01]                                                                                                                                                                                                                                                                                            |
| H01L 31/0445 | • • • • including thin film solar cells, e.g. single thin film a-Si, CIS or CdTe solar cells [2014.01]                                                                                                                                                                                                                                                                                                                                                                                  |
| H01L 31/046  | • • • • PV modules composed of a plurality of thin film solar cells deposited on the same substrate [2014.01]                                                                                                                                                                                                                                                                                                                                                                           |
| H01L 31/0463 | • • • • • characterised by special patterning methods to connect the PV cells in a module, e.g. laser cutting of the conductive or active layers [2014.01]                                                                                                                                                                                                                                                                                                                              |
| H01L 31/0465 | • • • • • comprising particular structures for the electrical interconnection of adjacent PV cells in the module (H01L 31/0463 takes precedence) [2014.01]                                                                                                                                                                                                                                                                                                                              |
| H01L 31/0468 | • • • • • comprising specific means for obtaining partial light transmission through the module, e.g. partially transparent thin film solar modules for windows [2014.01]                                                                                                                                                                                                                                                                                                               |
| H01L 31/047  | • • • PV cell arrays including PV cells having multiple vertical junctions or multiple V-groove junctions formed in a semiconductor substrate [2014.01]                                                                                                                                                                                                                                                                                                                                 |
| H01L 31/0475 | • • • PV cell arrays made by cells in a planar, e.g. repetitive, configuration on a single semiconductor substrate; PV cell microarrays (PV modules composed of a plurality of thin film solar cells deposited on the same substrate H01L 31/046) [2014.01]                                                                                                                                                                                                                             |
| H01L 31/048  | • • • Encapsulation of modules [2014.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| H01L 31/049  | • • • • Protective back sheets [2014.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| H01L 31/05   | • • • Electrical interconnection means between PV cells inside the PV module, e.g. series connection of PV cells (electrodes H01L 31/0224; electrical interconnection of thin film solar cells formed on a common substrate H01L 31/046; particular structures for electrical interconnecting of adjacent thin film solar cells in the module H01L 31/0465; electrical interconnection means specially adapted for electrically connecting two or more PV modules H02S 40/36) [2014.01] |
| H01L 31/052  | • • • Cooling means directly associated or integrated with the PV cell, e.g. integrated Peltier elements for active cooling or heat sinks directly associated with the PV cells (cooling means in combination with the PV module H02S 40/42) [2014.01]                                                                                                                                                                                                                                  |
| H01L 31/0525 | • • • including means to utilise heat energy directly associated with the PV cell, e.g. integrated Seebeck elements [2014.01]                                                                                                                                                                                                                                                                                                                                                           |
| H01L 31/053  | • • • Energy storage means directly associated or integrated with the PV cell, e.g. a capacitor integrated with a PV cell (energy storage means associated with the PV module H02S 40/38) [2014.01]                                                                                                                                                                                                                                                                                     |
| H01L 31/054  | • • • Optical elements directly associated or integrated with the PV cell, e.g. light-reflecting means or light-concentrating means [2014.01]                                                                                                                                                                                                                                                                                                                                           |
| H01L 31/055  | • • • where light is absorbed and re-emitted at a different wavelength by the optical element directly associated or integrated with the PV cell, e.g. by using luminescent material, fluorescent concentrators or up-conversion arrangements [2014.01]                                                                                                                                                                                                                                 |
| H01L 31/056  | • • • the light-reflecting means being of the back surface reflector [BSR] type [2014.01]                                                                                                                                                                                                                                                                                                                                                                                               |
| H01L 31/06   | • • • characterised by at least one potential-jump barrier or surface barrier [2012.01]                                                                                                                                                                                                                                                                                                                                                                                                 |
| H01L 31/061  | • • • the potential barriers being of the point-contact type (H01L 31/07 takes precedence) [2012.01]                                                                                                                                                                                                                                                                                                                                                                                    |
| H01L 31/062  | • • • the potential barriers being only of the metal-insulator-semiconductor type [2012.01]                                                                                                                                                                                                                                                                                                                                                                                             |
| H01L 31/065  | • • • the potential barriers being only of the graded gap type [2012.01]                                                                                                                                                                                                                                                                                                                                                                                                                |
| H01L 31/068  | • • • the potential barriers being only of the PN homojunction type, e.g. bulk silicon PN homojunction solar cells or thin film polycrystalline silicon PN homojunction solar cells [2012.01]                                                                                                                                                                                                                                                                                           |
| H01L 31/0687 | • • • • Multiple junction or tandem solar cells [2012.01]                                                                                                                                                                                                                                                                                                                                                                                                                               |
| H01L 31/0693 | • • • • the devices including, apart from doping material or other impurities, only $A_{III}B_V$ compounds, e.g. GaAs or InP solar cells [2012.01]                                                                                                                                                                                                                                                                                                                                      |
| H01L 31/07   | • • • the potential barriers being only of the Schottky type [2012.01]                                                                                                                                                                                                                                                                                                                                                                                                                  |
| H01L 31/072  | • • • the potential barriers being only of the PN heterojunction type [2012.01]                                                                                                                                                                                                                                                                                                                                                                                                         |
| H01L 31/0725 | • • • • Multiple junction or tandem solar cells [2012.01]                                                                                                                                                                                                                                                                                                                                                                                                                               |
| H01L 31/073  | • • • • comprising only $A_{III}B_{VI}$ compound semiconductors, e.g. CdS/CdTe solar cells [2012.01]                                                                                                                                                                                                                                                                                                                                                                                    |
| H01L 31/0735 | • • • • comprising only $A_{III}B_V$ compound semiconductors, e.g. GaAs/AlGaAs or InP/GaNAs solar cells [2012.01]                                                                                                                                                                                                                                                                                                                                                                       |
| H01L 31/074  | • • • • comprising a heterojunction with an element of Group IV of the Periodic System, e.g. ITO/Si, GaAs/Si or CdTe/Si solar cells [2012.01]                                                                                                                                                                                                                                                                                                                                           |
| H01L 31/0745 | • • • • comprising a $A_{IV}B_{IV}$ heterojunction, e.g. Si/Ge, SiGe/Si or Si/SiC solar cells [2012.01]                                                                                                                                                                                                                                                                                                                                                                                 |
| H01L 31/0747 | • • • • • comprising a heterojunction of crystalline and amorphous materials, e.g. heterojunction with intrinsic thin layer or HIT® solar cells [2012.01]                                                                                                                                                                                                                                                                                                                               |
| H01L 31/0749 | • • • • including a $A_{II}B_{III}C_{VI}$ compound, e.g. CdS/CuInSe <sub>2</sub> [CIS] heterojunction solar cells [2012.01]                                                                                                                                                                                                                                                                                                                                                             |
| H01L 31/075  | • • • the potential barriers being only of the PIN type, e.g. amorphous silicon PIN solar cells [2012.01]                                                                                                                                                                                                                                                                                                                                                                               |
| H01L 31/076  | • • • • Multiple junction or tandem solar cells [2012.01]                                                                                                                                                                                                                                                                                                                                                                                                                               |
| H01L 31/077  | • • • • the devices comprising monocrystalline or polycrystalline materials [2012.01]                                                                                                                                                                                                                                                                                                                                                                                                   |
| H01L 31/078  | • • • including different types of potential barriers provided for in two or more of groups H01L 31/061-H01L 31/075 [2012.01]                                                                                                                                                                                                                                                                                                                                                           |
| H01L 31/08   | • in which radiation controls flow of current through the device, e.g. photoresistors [2006.01]                                                                                                                                                                                                                                                                                                                                                                                         |
| H01L 31/09   | • • Devices sensitive to infra-red, visible or ultra-violet radiation (H01L 31/101 takes precedence) [2006.01]                                                                                                                                                                                                                                                                                                                                                                          |
| H01L 31/10   | • • characterised by at least one potential-jump barrier or surface barrier, e.g. phototransistors [2006.01]                                                                                                                                                                                                                                                                                                                                                                            |
| H01L 31/101  | • • • Devices sensitive to infra-red, visible or ultra-violet radiation [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                       |
| H01L 31/102  | • • • • characterised by only one potential barrier or surface barrier [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                        |
| H01L 31/103  | • • • • the potential barrier being of the PN homojunction type [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                               |
| H01L 31/105  | • • • • the potential barrier being of the PIN type [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                           |
| H01L 31/107  | • • • • the potential barrier working in avalanche mode, e.g. avalanche photodiode [2006.01]                                                                                                                                                                                                                                                                                                                                                                                            |
| H01L 31/108  | • • • • the potential barrier being of the Schottky type [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                      |
| H01L 31/109  | • • • • the potential barrier being of the PN heterojunction type [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                             |

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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| H01L 31/11        | • • • • characterised by two potential barriers or surface barriers, e.g. bipolar phototransistor [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| H01L 31/111       | • • • characterised by at least three potential barriers, e.g. photthyristor [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| H01L 31/112       | • • • • characterised by field-effect operation, e.g. junction field-effect photo- transistor [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| H01L 31/113       | • • • • being of the conductor-insulator- semiconductor type, e.g. metal- insulator-semiconductor field-effect transistor [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| H01L 31/115       | • • • Devices sensitive to very short wavelength, e.g. X-rays, gamma-rays or corpuscular radiation [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| H01L 31/117       | • • • of the bulk effect radiation detector type, e.g. Ge-Li compensated PIN gamma-ray detectors [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| H01L 31/118       | • • • of the surface barrier or shallow PN junction detector type, e.g. surface barrier alpha-particle detectors [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| H01L 31/119       | • • • characterised by field-effect operation, e.g. MIS type detectors [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| H01L 31/12        | • structurally associated with, e.g. formed in or on a common substrate with, one or more electric light sources, e.g. electroluminescent light sources, and electrically or optically coupled thereto (electroluminescent light sources <i>per se</i> H05B 33/00) [2006.01]                                                                                                                                                                                                                                                                                                        |
| H01L 31/14        | • • the light source or sources being controlled by the semiconductor device sensitive to radiation, e.g. image converters, image amplifiers, image storage devices [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                       |
| H01L 31/147       | • • • the light sources and the devices sensitive to radiation all being semiconductor devices characterised by at least one potential or surface barrier [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                 |
| H01L 31/153       | • • • • formed in, or on, a common substrate [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| H01L 31/16        | • • the semiconductor device sensitive to radiation being controlled by the light source or sources [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| H01L 31/167       | • • • the light sources and the devices sensitive to radiation all being semiconductor devices characterised by at least one potential or surface barrier [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                 |
| H01L 31/173       | • • • • formed in, or on, a common substrate [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| H01L 31/18        | • Processes or apparatus specially adapted for the manufacture or treatment of these devices or of parts thereof [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| H01L 31/20        | • • such devices or parts thereof comprising amorphous semiconductor material [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>H01L 33/00</b> | <b>Semiconductor devices with at least one potential-jump barrier or surface barrier specially adapted for light emission; Processes or apparatus specially adapted for the manufacture or treatment thereof or of parts thereof; Details thereof</b> (H01L 51/50 takes precedence; devices consisting of a plurality of semiconductor components formed in or on a common substrate and including semiconductor components with at least one potential-jump barrier or surface barrier, specially adapted for light emission H01L 27/15; semiconductor lasers H01S 5/00) [2010.01] |
|                   | Note(s) [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                   | 1. This group covers light emitting diodes [LEDs] or superluminescent diodes [SLDs], including LEDs or SLDs emitting infra-red [IR] light or ultra-violet [UV] light.                                                                                                                                                                                                                                                                                                                                                                                                               |
|                   | 2. In this group, the first place priority rule is applied, i.e. at each hierarchical level, in the absence of an indication to the contrary, classification is made in the first appropriate place.                                                                                                                                                                                                                                                                                                                                                                                |
| H01L 33/02        | • characterised by the semiconductor bodies [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| H01L 33/04        | • • with a quantum effect structure or superlattice, e.g. tunnel junction [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| H01L 33/06        | • • • within the light emitting region, e.g. quantum confinement structure or tunnel barrier [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| H01L 33/08        | • • with a plurality of light emitting regions, e.g. laterally discontinuous light emitting layer or photoluminescent region integrated within the semiconductor body (H01L 27/15 takes precedence) [2010.01]                                                                                                                                                                                                                                                                                                                                                                       |
| H01L 33/10        | • • with a light reflecting structure, e.g. semiconductor Bragg reflector [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| H01L 33/12        | • • with a stress relaxation structure, e.g. buffer layer [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| H01L 33/14        | • • with a carrier transport control structure, e.g. highly-doped semiconductor layer or current-blocking structure [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| H01L 33/16        | • • with a particular crystal structure or orientation, e.g. polycrystalline, amorphous or porous [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| H01L 33/18        | • • • within the light emitting region [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                   | Note(s) [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                   | • When classifying in this group, classification is also made in group H01L 33/26 or one of its subgroups in order to identify the chemical composition of the light emitting region.                                                                                                                                                                                                                                                                                                                                                                                               |
| H01L 33/20        | • • with a particular shape, e.g. curved or truncated substrate [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| H01L 33/22        | • • • Roughened surfaces, e.g. at the interface between epitaxial layers [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| H01L 33/24        | • • • of the light emitting region, e.g. non-planar junction [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| H01L 33/26        | • • Materials of the light emitting region [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| H01L 33/28        | • • • containing only elements of group II and group VI of the periodic system [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| H01L 33/30        | • • • containing only elements of group III and group V of the periodic system [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| H01L 33/32        | • • • • containing nitrogen [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| H01L 33/34        | • • • containing only elements of group IV of the periodic system [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| H01L 33/36        | • characterised by the electrodes [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| H01L 33/38        | • • with a particular shape [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| H01L 33/40        | • • Materials therefor [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| H01L 33/42        | • • • Transparent materials [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| H01L 33/44        | • characterised by the coatings, e.g. passivation layer or anti-reflective coating [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| H01L 33/46        | • • Reflective coating, e.g. dielectric Bragg reflector [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| H01L 33/48        | • characterised by the semiconductor body packages [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                   | Note(s) [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                   | • This group covers elements in intimate contact with the semiconductor body or integrated with the package.                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| H01L 33/50        | • • Wavelength conversion elements [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| H01L 33/52        | • • Encapsulations [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| H01L 33/54        | • • • having a particular shape [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| H01L 33/56        | • • • Materials, e.g. epoxy or silicone resin [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| H01L 33/58        | • • Optical field-shaping elements [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| H01L 33/60        | • • • Reflective elements [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| H01L 33/62        | • • Arrangements for conducting electric current to or from the semiconductor body, e.g. leadframe, wire-bond or solder balls [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| H01L 33/64        | • • Heat extraction or cooling elements [2010.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>H01L 35/00</b> | <b>Thermoelectric devices comprising a junction of dissimilar materials, i.e. exhibiting Seebeck or Peltier effect with or without other thermoelectric effects or thermomagnetic effects; Processes or apparatus specially adapted for the manufacture or treatment thereof or of parts thereof; Details thereof</b> (devices consisting of a plurality of solid state components formed in or on a common substrate H01L 27/00) [2006.01]                                                                                                                                         |
| H01L 35/02        | • Details [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| H01L 35/04        | • • Structural details of the junction; Connections of leads [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| H01L 35/06        | • • • detachable, e.g. using a spring [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| H01L 35/08        | • • • non-detachable, e.g. cemented, sintered, soldered [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| H01L 35/10        | • • • Connections of leads [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| H01L 35/12        | • Selection of the material for the legs of the junction [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| H01L 35/14        | • • using inorganic compositions [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| H01L 35/16        | • • • comprising tellurium or selenium or sulfur [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| H01L 35/18        | • • • comprising arsenic or antimony or bismuth (H01L 35/16 takes precedence) [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| H01L 35/20        | • • • comprising metals only (H01L 35/16, H01L 35/18 take precedence) [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| H01L 35/22        | • • • comprising compounds containing boron, carbon, oxygen, or nitrogen [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| H01L 35/24        | • • using organic compositions [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| H01L 35/26        | • • using compositions changing continuously or discontinuously inside the material [2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

|                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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| H01L 35/28                                                                                                                                                                     | • operating with Peltier or Seebeck effect only <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| H01L 35/30                                                                                                                                                                     | • • characterised by the heat-exchanging means at the junction <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| H01L 35/32                                                                                                                                                                     | • • characterised by the structure or configuration of the cell or thermo-couple forming the device <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| H01L 35/34                                                                                                                                                                     | • Processes or apparatus specially adapted for the manufacture or treatment of these devices or of parts thereof <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>H01L 37/00</b>                                                                                                                                                              | <b>Thermoelectric devices without a junction of dissimilar materials; Thermomagnetic devices, e.g. using Nernst-Ettinghausen effect; Processes or apparatus specially adapted for the manufacture or treatment thereof or of parts thereof</b> (devices consisting of a plurality of solid state components formed in or on a common substrate <a href="#">H01L 27/00</a> ) <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                               |
| H01L 37/02                                                                                                                                                                     | • using thermal change of dielectric constant, e.g. working above and below the Curie point <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| H01L 37/04                                                                                                                                                                     | • using thermal change of magnetic permeability, e.g. working above and below the Curie point <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>H01L 39/00</b>                                                                                                                                                              | <b>Devices using superconductivity or hyperconductivity; Processes or apparatus specially adapted for the manufacture or treatment thereof or of parts thereof</b> (devices consisting of a plurality of solid state components formed in or on a common substrate <a href="#">H01L 27/00</a> ; superconductors characterised by the ceramic-forming technique or the ceramic composition <a href="#">C04B 35/00</a> ; superconductive or hyperconductive conductors, cables, or transmission lines <a href="#">H01B 12/00</a> ; superconductive coils or windings <a href="#">H01F</a> ; amplifiers using superconductivity <a href="#">H03F 19/00</a> ) <a href="#">[2006.01]</a> |
| H01L 39/02                                                                                                                                                                     | • Details <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| H01L 39/04                                                                                                                                                                     | • • Containers; Mountings <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| H01L 39/06                                                                                                                                                                     | • • characterised by the current path <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| H01L 39/08                                                                                                                                                                     | • • characterised by the shape of the element <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| H01L 39/10                                                                                                                                                                     | • • characterised by the means for switching <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| H01L 39/12                                                                                                                                                                     | • • characterised by the material <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| H01L 39/14                                                                                                                                                                     | • Permanent superconductor devices <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| H01L 39/16                                                                                                                                                                     | • Devices switchable between superconductive and normal states <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| H01L 39/18                                                                                                                                                                     | • • Cryotrons <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| H01L 39/20                                                                                                                                                                     | • • • Power cryotrons <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| H01L 39/22                                                                                                                                                                     | • Devices comprising a junction of dissimilar materials, e.g. Josephson-effect devices <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| H01L 39/24                                                                                                                                                                     | • Processes or apparatus specially adapted for the manufacture or treatment of devices provided for in group <a href="#">H01L 39/00</a> or of parts thereof <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>H01L 41/00</b>                                                                                                                                                              | <b>Piezo-electric devices in general; Electrostrictive devices in general; Magnetostrictive devices in general; Processes or apparatus specially adapted for the manufacture or treatment thereof or of parts thereof; Details thereof</b> (devices consisting of a plurality of solid-state components formed in or on a common substrate <a href="#">H01L 27/00</a> ) <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                   |
| Note(s) <a href="#">[6]</a>                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 1. This group <u>does not cover</u> adaptations for particular purposes, which are covered by the relevant places.                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 2. Attention is drawn to the following such places:                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                | <a href="#">B06B</a> for adaptations for generating or transmitting mechanical vibrations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                | <a href="#">G01</a> for transducers as sensing elements for measuring                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                                                                                                                                                | <a href="#">G04C</a> , <a href="#">G04F</a> for transducers adapted for use in time-pieces                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                                                                                                                                                                | <a href="#">G10K</a> for adaptations for generating or transmitting sound                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                | <a href="#">H02N</a> for arrangements of elements in electric machines                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                                                                                                                                                | <a href="#">H03H 9/00</a> for networks comprising electro-mechanical or electro-acoustic elements, e.g. resonant circuits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                | <a href="#">H04R</a> for loudspeakers, microphones, gramophone pick-ups or like transducers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| H01L 41/02                                                                                                                                                                     | • Details <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| H01L 41/04                                                                                                                                                                     | • • of piezo-electric or electrostrictive elements <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| H01L 41/047                                                                                                                                                                    | • • • Electrodes <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| H01L 41/053                                                                                                                                                                    | • • • Mounts, supports, enclosures or casings <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| H01L 41/06                                                                                                                                                                     | • • of magnetostrictive elements <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| H01L 41/08                                                                                                                                                                     | • Piezo-electric or electrostrictive elements <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| H01L 41/083                                                                                                                                                                    | • • having a stacked or multilayer structure <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| H01L 41/087                                                                                                                                                                    | • • formed as coaxial cables <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Note(s) <a href="#">[6]</a>                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| • Groups <a href="#">H01L 41/083</a> and <a href="#">H01L 41/087</a> take precedence over groups <a href="#">H01L 41/09</a> - <a href="#">H01L 41/113</a> .                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| H01L 41/09                                                                                                                                                                     | • • with electrical input and mechanical output <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| H01L 41/107                                                                                                                                                                    | • • with electrical input and electrical output <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| H01L 41/113                                                                                                                                                                    | • • with mechanical input and electrical output <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| H01L 41/12                                                                                                                                                                     | • Magnetostrictive elements <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| H01L 41/16                                                                                                                                                                     | • Selection of materials <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| H01L 41/18                                                                                                                                                                     | • • for piezo-electric or electrostrictive elements <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| H01L 41/187                                                                                                                                                                    | • • • Ceramic compositions <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| H01L 41/193                                                                                                                                                                    | • • • Macromolecular compositions <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| H01L 41/20                                                                                                                                                                     | • • for magnetostrictive elements <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| H01L 41/22                                                                                                                                                                     | • Processes or apparatus specially adapted for the assembly, manufacture or treatment of piezo-electric or electrostrictive devices or of parts thereof <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| H01L 41/23                                                                                                                                                                     | • • Forming enclosures or casings <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| H01L 41/25                                                                                                                                                                     | • • Assembling devices that include piezo-electric or electrostrictive parts <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| H01L 41/253                                                                                                                                                                    | • • Treating devices or parts thereof to modify a piezo-electric or electrostrictive property, e.g. polarisation characteristics, vibration characteristics or mode tuning <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| H01L 41/257                                                                                                                                                                    | • • • by polarising <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| H01L 41/27                                                                                                                                                                     | • • Manufacturing multilayered piezo-electric or electrostrictive devices or parts thereof, e.g. by stacking piezo-electric bodies and electrodes <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| H01L 41/273                                                                                                                                                                    | • • • by integrally sintering piezo-electric or electrostrictive bodies and electrodes <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| H01L 41/277                                                                                                                                                                    | • • • by stacking bulk piezo-electric or electrostrictive bodies and electrodes <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| H01L 41/29                                                                                                                                                                     | • • Forming electrodes, leads or terminal arrangements <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Note(s) <a href="#">[2013.01]</a>                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| • The integral arrangement of individual layer electrodes and connection electrodes is classified in both groups <a href="#">H01L 41/293</a> and <a href="#">H01L 41/297</a> . |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| H01L 41/293                                                                                                                                                                    | • • • Connection electrodes of multilayered piezo-electric or electrostrictive parts <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| H01L 41/297                                                                                                                                                                    | • • • Individual layer electrodes of multilayered piezo-electric or electrostrictive parts <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| H01L 41/31                                                                                                                                                                     | • • Applying piezo-electric or electrostrictive parts or bodies onto an electrical element or another base <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| H01L 41/311                                                                                                                                                                    | • • • Mounting of piezo-electric or electrostrictive parts together with semiconductor elements, or other circuit elements, on a common substrate <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| H01L 41/312                                                                                                                                                                    | • • • by laminating or bonding of piezo-electric or electrostrictive bodies <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| H01L 41/313                                                                                                                                                                    | • • • • by metal fusing or with adhesives <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| H01L 41/314                                                                                                                                                                    | • • • • by depositing piezo-electric or electrostrictive layers, e.g. aerosol or screen printing <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| H01L 41/316                                                                                                                                                                    | • • • • by vapour phase deposition <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| H01L 41/317                                                                                                                                                                    | • • • • by liquid phase deposition <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| H01L 41/318                                                                                                                                                                    | • • • • • by sol-gel deposition <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| H01L 41/319                                                                                                                                                                    | • • • • using intermediate layers, e.g. for growth control <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| H01L 41/33                                                                                                                                                                     | • • Shaping or machining of piezo-electric or electrostrictive bodies <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| H01L 41/331                                                                                                                                                                    | • • • by coating or depositing using masks, e.g. lift-off <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| H01L 41/332                                                                                                                                                                    | • • • by etching, e.g. lithography <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| H01L 41/333       | • • • by moulding or extrusion <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| H01L 41/335       | • • • by machining <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| H01L 41/337       | • • • • by polishing or grinding <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| H01L 41/338       | • • • • by cutting or dicing <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| H01L 41/339       | • • • • by punching <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| H01L 41/35        | • • Forming piezo-electric or electrostrictive materials <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| H01L 41/37        | • • Composite materials <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| H01L 41/39        | • • Inorganic materials <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| H01L 41/41        | • • • • by melting <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| H01L 41/43        | • • • • by sintering <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| H01L 41/45        | • • Organic materials <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| H01L 41/47        | • Processes or apparatus specially adapted for the assembly, manufacture or treatment of magnetostrictive devices or of parts thereof <a href="#">[2013.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>H01L 43/00</b> | <b>Devices using galvanic-magnetic or similar magnetic effects; Processes or apparatus specially adapted for the manufacture or treatment thereof or of parts thereof</b> (devices consisting of a plurality of solid state components formed in or on a common substrate <a href="#">H01L 27/00</a> ) <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                    |
| H01L 43/02        | • Details <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| H01L 43/04        | • • of Hall-effect devices <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| H01L 43/06        | • Hall-effect devices <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| H01L 43/08        | • Magnetic-field-controlled resistors <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| H01L 43/10        | • Selection of materials <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| H01L 43/12        | • Processes or apparatus specially adapted for the manufacture or treatment of these devices or of parts thereof <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| H01L 43/14        | • • for Hall-effect devices <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>H01L 45/00</b> | <b>Solid state devices specially adapted for rectifying, amplifying, oscillating, or switching without a potential-jump barrier or surface barrier, e.g. dielectric triodes; Ovshinsky-effect devices; Processes or apparatus specially adapted for the manufacture or treatment thereof or of parts thereof</b> (devices consisting of a plurality of solid state components formed in or on a common substrate <a href="#">H01L 27/00</a> ; devices using superconductivity or hyperconductivity <a href="#">H01L 39/00</a> ; piezo-electric elements <a href="#">H01L 41/00</a> ; bulk negative resistance effect devices <a href="#">H01L 47/00</a> ) <a href="#">[2006.01]</a> |
| H01L 45/02        | • Solid state travelling-wave devices <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>H01L 47/00</b> | <b>Bulk negative resistance effect devices, e.g. Gunn-effect devices; Processes or apparatus specially adapted for the manufacture or treatment thereof or of parts thereof</b> (devices consisting of a plurality of solid state components formed in or on a common substrate <a href="#">H01L 27/00</a> ) <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                              |
| H01L 47/02        | • Gunn-effect devices <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>H01L 49/00</b> | <b>Solid state devices not provided for in groups <a href="#">H01L 27/00</a>-<a href="#">H01L 47/00</a> and <a href="#">H01L 51/00</a> and not provided for in any other subclass; Processes or apparatus specially adapted for the manufacture or treatment thereof or of parts thereof</b> <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                              |
| H01L 49/02        | • Thin-film or thick-film devices <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>H01L 51/00</b> | <b>Solid state devices using organic materials as the active part, or using a combination of organic materials with other materials as the active part; Processes or apparatus specially adapted for the manufacture or treatment of such devices, or of parts thereof</b> (devices consisting of a plurality of components formed in or on a common substrate <a href="#">H01L 27/28</a> ; thermoelectric devices using organic material <a href="#">H01L 35/00</a> , <a href="#">H01L 37/00</a> ; piezo-electric, electrostrictive or magnetostrictive elements using organic material <a href="#">H01L 41/00</a> ) <a href="#">[2006.01]</a>                                     |
| H01L 51/05        | • specially adapted for rectifying, amplifying, oscillating or switching and having at least one potential-jump barrier or surface barrier; Capacitors or resistors with at least one potential-jump barrier or surface barrier <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                           |
| H01L 51/10        | • • Details of devices <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| H01L 51/30        | • • Selection of materials <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| H01L 51/40        | • • Processes or apparatus specially adapted for the manufacture or treatment of such devices or of parts thereof <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| H01L 51/42        | • specially adapted for sensing infra-red radiation, light, electromagnetic radiation of shorter wavelength, or corpuscular radiation; specially adapted either for the conversion of the energy of such radiation into electrical energy or for the control of electrical energy by such radiation <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                       |
| H01L 51/44        | • • Details of devices <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| H01L 51/46        | • • Selection of materials <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| H01L 51/48        | • • Processes or apparatus specially adapted for the manufacture or treatment of such devices or of parts thereof <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| H01L 51/50        | • specially adapted for light emission, e.g. organic light emitting diodes (OLED) or polymer light emitting devices (PLED) (organic semiconductor lasers <a href="#">H01S 5/36</a> ) <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| H01L 51/52        | • • Details of devices <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| H01L 51/54        | • • Selection of materials <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| H01L 51/56        | • • Processes or apparatus specially adapted for the manufacture or treatment of such devices or of parts thereof <a href="#">[2006.01]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |